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**Hamiltonian systems with constraints: a geometric approach.** (English) Zbl 0697.58019  
*Int. J. Theor. Phys.* 28, No. 11, 1405-1417 (1989).

Let  $M$  be a differential manifold and  $TM$ ,  $T^*M$  be its tangent and cotangent bundles. Under the Legendre transformation  $FL : TM \rightarrow T^*M$ , if the image of  $FL$  is a proper submanifold of  $T^*M$ , one obtains a Hamiltonian system with constraint. Then the corresponding equation of motion is the so-called Hamiltonian-Dirac equation. The author discusses first the local problem in which the image of  $FL$  is a submanifold of  $T^*M$  defined by the zeros of a finite family of functions. Then he turns to discuss the global problem in which the image of  $FL$  is any submanifold of  $T^*M$ . In both cases the author proposes a new algorithm to obtain the constraint submanifold and the dynamical vector field on it. A simple example is given.

Reviewer: [Guizhang Tu](#)

**MSC:**

- [70H45](#) Constrained dynamics, Dirac's theory of constraints
- [70G45](#) Differential geometric methods (tensors, connections, symplectic, Poisson, contact, Riemannian, nonholonomic, etc.) for problems in mechanics
- [37J99](#) Dynamical aspects of finite-dimensional Hamiltonian and Lagrangian systems

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**Keywords:**

[Hamiltonian system](#); [Hamiltonian-Dirac equation](#)

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**References:**

- [1] Abraham, R., and Marsden, J. E. (1978). *Foundations of Mechanics*, Benjamin/Cummings Publishing Company, Reading, Massachusetts. · [Zbl 0393.70001](#)
- [2] Battle, C., Gomis, J., Pons, J., and Roman Roy, N. (1986). Equivalence between the Lagrangian and Hamiltonian formalism for constrained systems, *Journal of Mathematical Physics*, 27, 2953-2962. · [Zbl 0613.70012](#) · [doi:10.1063/1.527274](#)
- [3] De Le'n, M., and Rodrigues, X. X. (1985). *Generalized Classical Mechanics and Fields Theory*, North-Holland/Elsevier, Amsterdam.
- [4] Dirac, P. A. M. (1950). Generalized Hamiltonian dynamics, *Canadian Journal of Mathematics*, 2, 129-148. · [Zbl 0036.14104](#) · [doi:10.4153/CJM-1950-012-1](#)
- [5] Dirac, P. A. M. (1964). *Lectures on Quantum Mechanics*, Belfer Graduate School of Science, Yeshiva University. · [Zbl 0141.44603](#)
- [6] Gotay, M. J., and Nester, J. M. (1979). Presymplectic Lagrangian systems I, *Annales de l'Institut Henri Poincaré*, 30, 129-142. · [Zbl 0414.58015](#)
- [7] Gotay, M. J., and Nester, J. M. (1980). Presymplectic Lagrangian systems II, *Annales de l'Institut Henri Poincaré*, 32, 1-13. · [Zbl 0453.58016](#)
- [8] Gotay, M. J., Nester, J. M., and Hinds, G. (1978). Presymplectic manifolds and the Dirac-Bergman theory of constraints, *Journal of Mathematical Physics*, 19, 2388-2399. · [Zbl 0418.58010](#) · [doi:10.1063/1.523597](#)
- [9] Lichnerowicz, A. (1975). Variétés symplectiques et dynamique associée à une sous-variété, *Comptes Rendus de l'Académie des Sciences*, 280A, 523-527. · [Zbl 0315.70016](#)
- [10] Sternberg, S. (1964). *Lectures on Differential Geometry*, Prentice-Hall. · [Zbl 0129.13102](#)

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